

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 303 005 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

16.04.2003 Bulletin 2003/16

(51) Int Cl.7: H01R 9/05

(21) Application number: 01124083.5

(22) Date of filing: 10.10.2001

(84) Designated Contracting States:

AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR

Designated Extension States:

AL LT LV MK RO SI

(71) Applicant: Corning Cabelcon A/S

4760 Vordingborg (DK)

(72) Inventor: Henningsen, Jimmy Ciesla

4700 Naestved (DK)

(74) Representative: Roerboel, Leif et al

Budde, Schou & Ostenfeld A/S,
Vester Soegade 10

1601 Copenhagen V (DK)

(54) Inner conductor system

(57) The invention relates to a connector for a coaxial cable essentially comprising an outer bushing for providing an axial displacement of parts in the connector, whereby these parts are brought into mechanical and electrical engagement with the coaxial cable, the connector being furthermore provided with a centre terminal comprising an end portion for connection to the inner conductor of the cable and where said end portion on the inner circumferential surface hereof is provided with an annular contact surface longitudinally extending over

a predefined distance and protruding radially inwardly from said inner circumferential surface to establishment of a firm and reliable electrical and mechanical contact between the centre terminal and the inner conductor of the coaxial cable. The establishment of electrical contact between the centre terminal and the inner conductor of the cable does in this manner not lead to a damage of the surface layer of the centre conductor and hence no degradation of the high frequency signal passing through the conductor is caused.

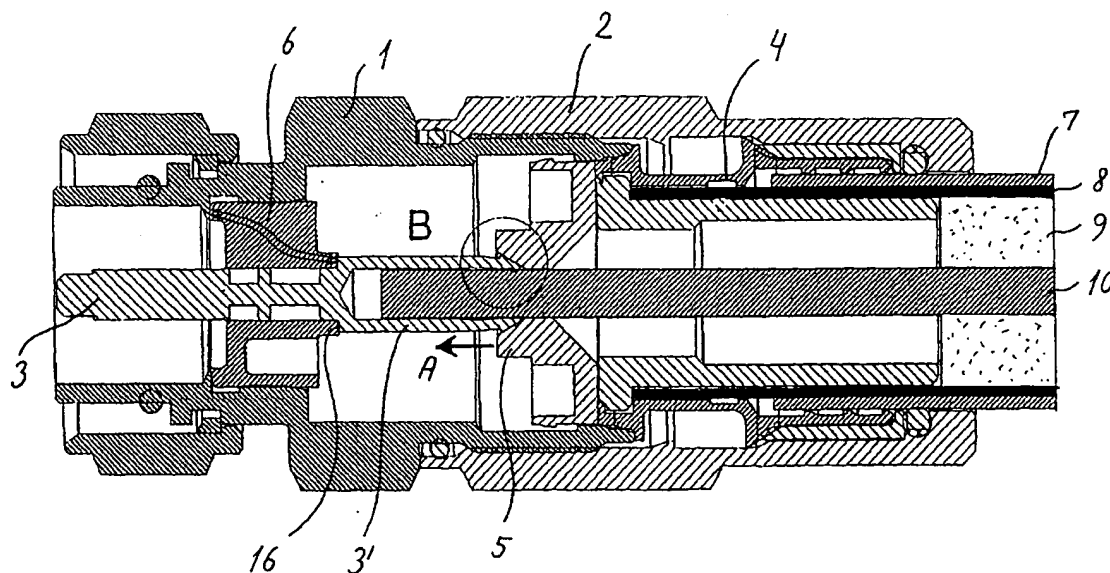


Fig. 1

EP 1 303 005 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to connectors for coaxial cables of the kind set forth in the preamble of claim 1 and more particularly to the connection between the inner conductor of the coaxial cable and the centre terminal of the coaxial connector.

BACKGROUND ART

[0002] In connectors of the above kind it is known to obtain mechanically and electrically stable connections between the inner- and outer conductor of the coaxial cable and the corresponding inner- (or centre-) terminal and main body of the connector. These stable connections are typically brought about by appropriate axial displacements of the various parts of the connector relative to each other such that these displacements are transformed into corresponding inwardly directed radial displacements of contact surfaces of the connector exerting a sufficiently strong pressure against the corresponding inner- and outer conductors of the cable. In order to obtain reliable electrical and mechanical connections, these contact surfaces are furthermore often provided with appropriate threads or protrusions, which may penetrate the surface of the inner conductor, thereby contributing to increased reliability of the connections.

[0003] A number of such connectors are known within the art. Specifically EP 0 994 527 with the same applicant as the present application discloses a coaxial connector provided with threads on the contact surface between the inner conductor of the cable and the centre terminal as mentioned above.

[0004] Furthermore, US 5,595,502 discloses a connector for a coaxial cable having hollow inner conductor, where the centre terminal of the connector during mounting of the cable on the connector is brought into the hollow inner conductor, and where the portion of the centre terminal inserted into the inner conductor is furthermore provided with threads engaging the inner surface of the hollow conductor.

[0005] In US 6,120,314 there is disclosed a plug connector for the electrically conductive connection of conductor tracks on a board to at least one coaxial cable where the connector is provided with an insertion duct comprising two tubular sections being able to accommodate the inner- and outer conductor of a coaxial cable, respectively. These sections are both provided with inwardly directed protrusions which during mounting of the cable in the connector are brought to penetrate the insulation material around the inner- and outer conductors, respectively, and exert a strong pressure against the surface of the corresponding conductor.

[0006] While the arrangement of protrusions or threads as exemplified by the above disclosures un-

doubtedly leads to a more stable mechanical attachment of the respective conductor of the cable to the corresponding conductor in the connector, such arrangements may nevertheless be undesirable as they may lead to a deterioration of the transmission of high frequency signals at the contact surfaces between the cable and the connector, especially at the interface between the inner conductor of the cable and the corresponding centre terminal of the connector. This is due to the fact that the inner conductor of many known coaxial cables is formed by for instance an aluminium core which is provided with a very thin cladding of another conductive material such as copper. At high frequencies the signal current practically takes place only through the very thin cladding due to the skin effect; and local destructions of this cladding caused by the penetration of said threads or protrusions lead to local impedance discontinuities, which tend to degrade signal transmission. It is hence desirable to provide attachment means, especially between the inner conductor of the cable and the centre terminal of the conductor that attains said high stability and reliability of connection without introducing the degradation of the electrical signal as described above.

DISCLOSURE OF THE INVENTION

[0007] Based on the problems described above it is the object of the present invention to provide a connector for a coaxial cable which ensures a firm and reliable electrical and mechanical contact between the inner conductor of the cable and the centre terminal of the connector without giving rise to the degradations of signal propagation at the interface between the inner conductor and the centre terminal as described initially.

[0008] This object is attained with a coaxial connector according to the characterising clause of claim 1.

[0009] According to the present invention there is thus provided a connector for a coaxial cable essentially comprising an outer bushing for providing an axial displacement of parts in the connector, whereby these parts are brought into mechanical and electrical engagement with the coaxial cable, the axial displacement being provided by screwing a thread provided on said bushing onto a corresponding thread provided on the main body of the connector, the connector being furthermore provided with a centre terminal attached to the main body of the connector via a tubular member and comprising an end portion for connection to the inner conductor of the cable, said end portion being provided with engagement means for engagement with corresponding engagement means provided on a tubular body coaxially and displaceably mounted in the connector, and where said end portion is a tubular body longitudinally provided with a number of slits facilitating the axial compression of the end portion around the inner conductor of the cable, and where the connector is furthermore characterised in that said end portion on the

inner circumferential surface hereof is provided with an annular contact surface longitudinally extending over a predefined distance and protruding radially inwardly from said inner circumferential surface to establishment of a firm and reliable electrical and mechanical contact between the centre terminal and the inner conductor of the coaxial cable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention will now be described in more detail with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal cross-sectional view through a connector according to the invention;
Figure 2 is a detailed view showing a part of the interface between the centre terminal of the connector and the inner conductor of the cable; and
Figure 3 is a perspective view of a detail of the centre terminal shown in Figures 1 and 2.

DETAILED DESCRIPTION OF THE INVENTION

[0011] In the following, a detailed description of an embodiment of the invention is given.

[0012] With reference to Figure 1a there is shown a connector for a coaxial cable essentially comprising a tubular main body 1 upon which a tubular outer bushing 2 can be screwed by means of appropriate threads provided on the outer surface of a portion of the main body and a corresponding inner surface of the outer bushing thus providing the possibility to displace the main body and the outer bushing relative to each other as mentioned in the description of prior art.

[0013] One effect of providing said displacement between the main body (1) and the outer bushing (2) is that the axially displaceable part 5 surrounding the inner conductor 10 of the cable will be displaced in the direction towards the centre terminal 3 as indicated by the arrow A in the Figure. Due to the engagement between the conical face 11 of the displaceable part 5 and a corresponding conical face 12 on the end portion 3' of the centre terminal 3, the end portion 3' will be pressed radially inwards towards the inner conductor 10, the end portion 3' being axially retained by engagement with a tubular member 6 by means of which member the centre terminal 3 of the connector is furthermore attached to the main body 1.

[0014] With reference to Figures 2 and 3, the end portion 3' of the centre terminal 3 according to this embodiment of the invention will be described in detail in the following. The end portion 3' is formed as a tubular member of an inner diameter that over the major longitudinal length of the end portion 3' is somewhat larger than the diameter of the inner conductor 10 of the coaxial cable. During mounting of the connector on the cable, the inner conductor 10 is inserted into this tubular member ap-

proximately as shown in Figure 1. The tubular member is provided with a plurality of longitudinally extending slits 15, typically 4 slits, although other numbers could also be used. The presence of these slits 15 facilitates the inwardly directed compression of the end portion 3' around the inner conductor 10. At that end of said end portion 3' facing the coaxial cable, i.e. to the right in Figures 1 and 2, the tubular member is on the inner circumferential surface hereof provided with an annular protruding contact area 14 encircling the inner conductor 10. The inner diameter of this protruding contact area 14 is chosen such that it is possible during mounting of the connector on the cable to pass the inner conductor 10 longitudinally through this contact area 14 and further into the tubular member to a final position as for instance indicated in Figure 1. The insertion of the inner conductor 10 of the cable into the end portion 3' is furthermore facilitated by the presence of the inclined end face 17 on the end portion 3'.

[0015] When the connector is mounted on the cable, the above described longitudinal displacement of the axially displaceable part 5 over the end of the end portion 3' will result in the contact surface 14 being pressed against the inner conductor 10 of the cable, thereby depressing the surface of the inner conductor 10, however, without the contact surface 14 penetrating a coating present on the outer circumferential surface of the inner conductor 10. Thus, a firm and reliable electrical and mechanical contact between the centre terminal 3 and the inner conductor 10 can be established without the risk of interfering with the high frequency signal propagation from the inner conductor 10 to the centre terminal 3 as described initially. Furthermore, the presence of the back face 16 of the contact area 14 provides a firm grip on the inner conductor, if it is for instance attempted to pull the connector off the cable.

[0016] Although one embodiment of the present invention has been shown and described in the preceding parts of the detailed description, it is understood that a person skilled in the art may conceive other embodiments of the invention without departing from the scope of the invention as defined by the following claims.

PARTS LIST

[0017]

1. Main body of connector
2. Outer bushing of connector
3. Centre terminal of connector
- 3' End portion of centre terminal
4. Ferrule
5. Axially displaceable part
6. Tubular member
7. Jacket of cable
8. Outer conductor of cable
9. Dielectric of cable
10. Inner conductor of cable

- 11. First conical face
- 12. Second conical face
- 13. Inner circumferential surface of end portion
- 14. Contact area
- 15. Longitudinal slit
- 16. Back face of contact area
- 17. Inclined end face of contact area

Claims

1. Connector for a coaxial cable comprising a bushing (2) for providing an axial displacement of parts in the connector, whereby these parts are brought into mechanical and electrical engagement with the coaxial cable, the axial displacement being provided by screwing a thread provided on the bushing (2) onto a corresponding thread provided on the main body (1) of the connector, the connector being furthermore provided with a centre terminal (3) attached to a tubular member (6) and comprising an end portion (3') for connection to the inner conductor (10) of the cable, said end portion (3') being provided with engagement means (12) for engagement with corresponding engagement means (11) provided on a tubular body (5) coaxially and displaceably mounted in the connector, and where said end portion (3') is a tubular body longitudinally provided by a number of slits (15), **characterised in that** said end portion (3') on the inner circumferential surface (13) hereof being provided with an annular contact surface (14) longitudinally extending over a predefined distance (d) and protruding radially inwardly from said inner circumferential surface (13).
2. Connector according to claim 1, **characterised in that** said annular contact surface (14) is substantially cylindrical.
3. Connector according to claim 1, **characterised in that** said annular contact surface (14) on one longitudinal end hereof is provided with an inclined end face (17).
4. Connector according to claim 1, **characterised in that** said annular contact surface (14) on one longitudinal end hereof is provided with a radially inwardly extending back face (16).

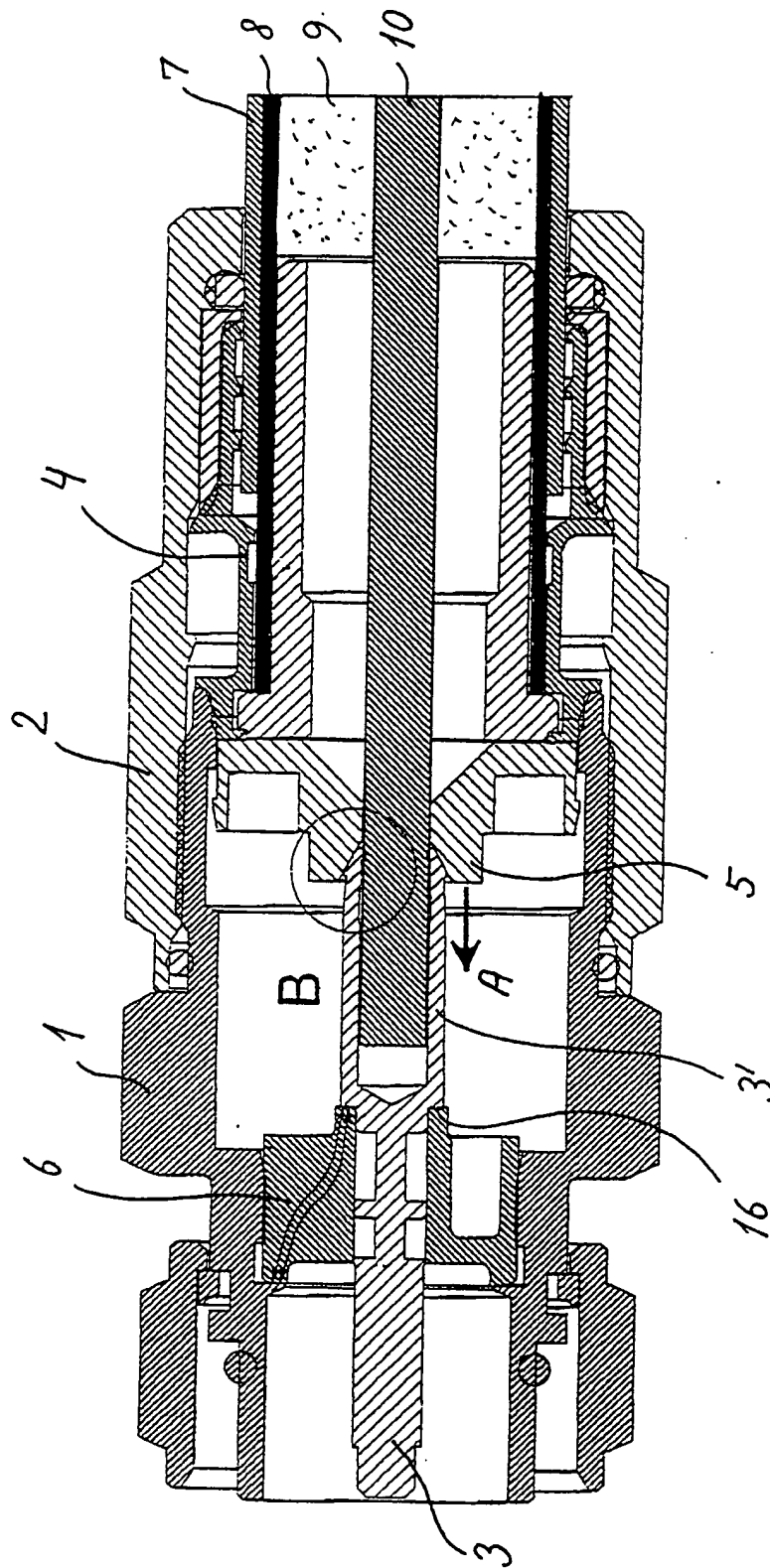


Fig. 1

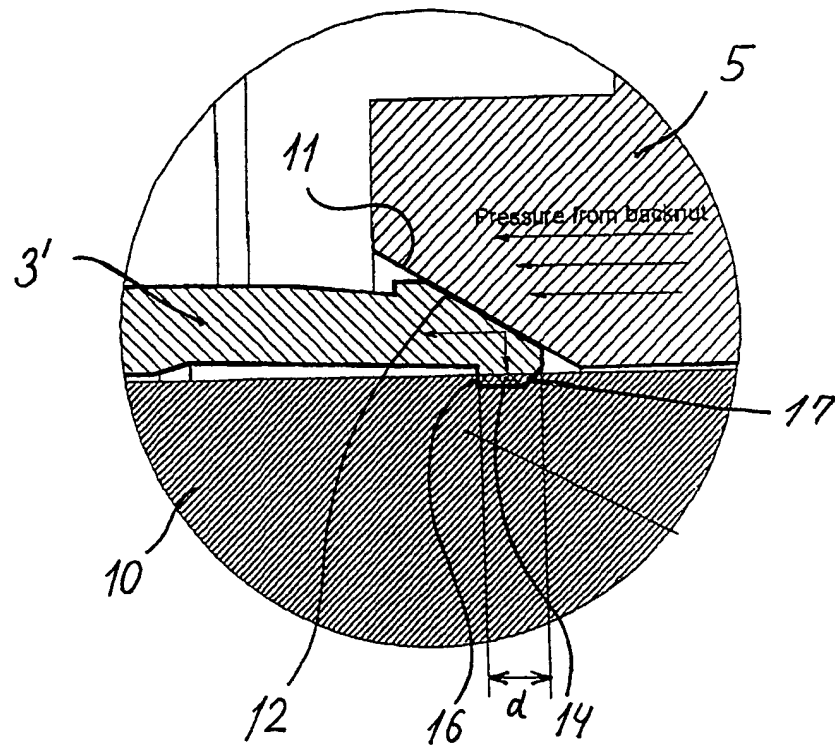


Fig. 2

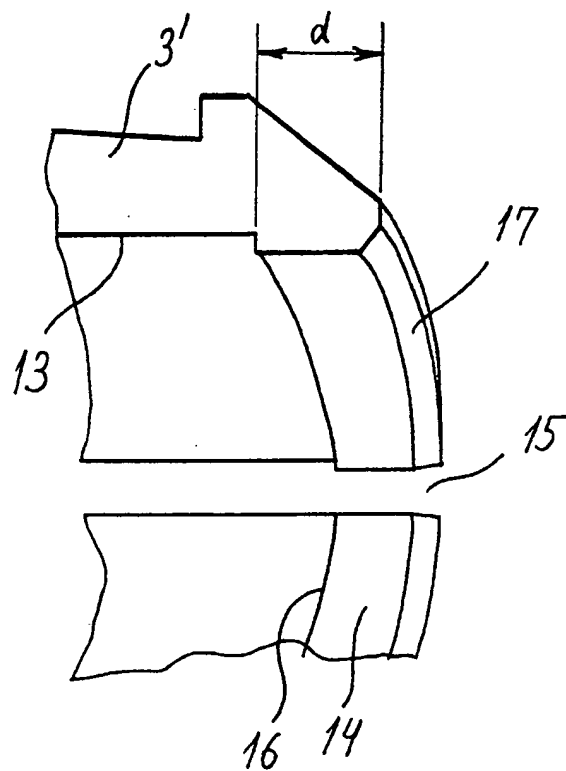


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 01 12 4083

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 19 05 182 A (KATHREIN-WERKE, ANTON KATREIN, 8200 ROSENHEIM) 17 September 1970 (1970-09-17)	1	H01R9/05
Y	* figures 1-4 * * page 3, line 23 - page 6, line 26 *	2-4	
Y	EP 1 028 498 A (SPINNER GMBH ELEKTROTECH) 16 August 2000 (2000-08-16) * abstract; figures 4,5 * * column 3, line 43 - column 5, line 39 *	2-4	
A	EP 1 122 835 A (CABEL CON AS) 8 August 2001 (2001-08-08) * abstract; figures 1,2 * * column 5, line 15 - column 7, line 15 *	1-4	
A	US 3 836 946 A (GEIGER A) 17 September 1974 (1974-09-17) * abstract; figure 1 * * column 2, line 20 - column 4, line 29 *	4	
The present search report has been drawn up for all claims			<p>TECHNICAL FIELDS SEARCHED (Int.Cl.7)</p> <p>H01R</p>
Place of search		Date of completion of the search	Examiner
THE HAGUE		15 March 2002	Serrano Funcia, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date C : document cited in the application I : document cited for other reasons S : member of the same patent family, corresponding document</p>			

EPIC FORM 1 (01/03/02) (P04001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 12 4083

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-03-2002

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 1905182	A	17-09-1970	DE	1905182 A1	17-09-1970
EP 1028498	A	16-08-2000	EP	1028498 A1	16-08-2000
EP 1122835	A	08-08-2001	EP	1122835 A1	08-08-2001
US 3836946	A	17-09-1974	DE	2215757 A1	04-10-1973
			FR	2178181 A1	09-11-1973
			IT	981634 B	10-10-1974
			JP	1100992 C	18-06-1982
			JP	49008791 A	25-01-1974
			JP	56036551 B	25-08-1981
			NL	7304427 A	02-10-1973
			SE	391842 B	28-02-1977
			YU	80073 A , 8	31-10-1978

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82